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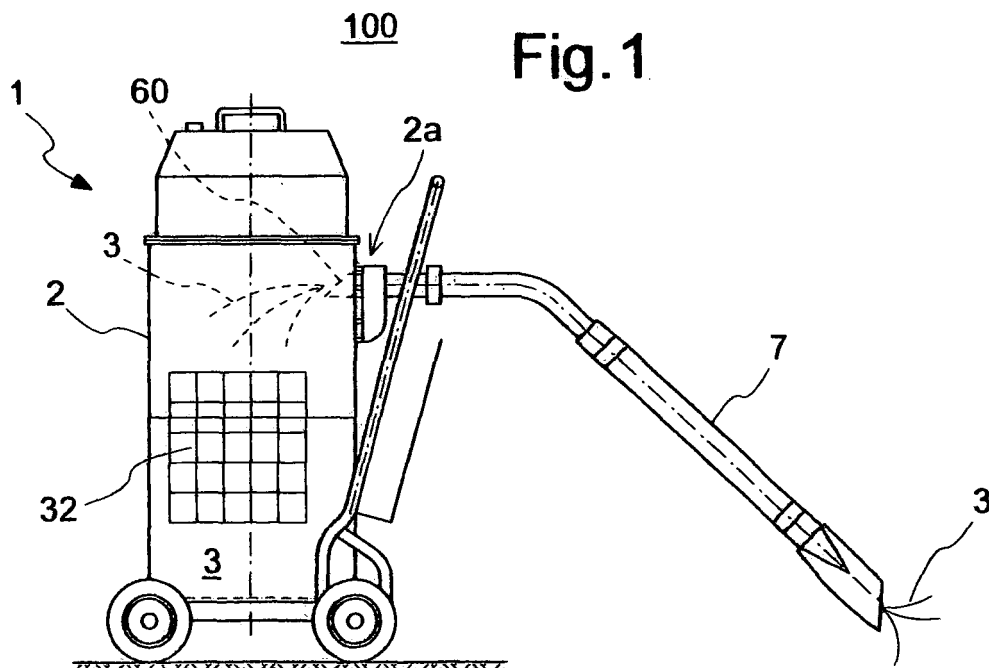
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(54) **Wet/dry industrial vacuum cleaner**

(57) Industrial aspirator for the suction and discharging of liquid and solid substances, comprising a container to temporarily contain the said liquid and solid substances aspirated through at least one sleeve in fluid connection to this and a means of producing and directing in alternate way a flow of air through one or more openings of said container from the outside into said container and vice-versa, characterized by said means comprising at

least one first ventilation unit to produce said flow of air from the inside to the outside of said container through said one or more openings, at least one second ventilation unit to produce said flow of air from the outside into said container through said one or more openings, and at least one duct for each of said first and second ventilation units directing the said flow of air through said one or more openings of said container.



Description

Field of the invention

[0001] The present invention relates to an industrial aspirator (i.e. an industrial vacuum cleaner) for the suction of liquid and solid substances. In particular, the invention relates to an aspirator that, through the use of a sleeve in fluid connection with the same aspirator, is able to guarantee both the suction of liquid and solid substances that are found, for instance, strewn untidily on a floor to be cleaned up, and the pumping of the same previously aspirated liquid substances to the outside. This latter operation step of the aspirator is performed without needing to open the aspirator but, on the contrary, by simply putting the aspirated liquid under pressure, which expels the same liquid generally through the same sleeve employed for the suction of the liquid and solid substances.

Prior art

[0002] According to the prior art, such industrial aspirators are provided with a container for the containment of the liquid and/or solid substances aspirated, and a means of producing alternate steps of suction and pressurization inside the said container. In this way, the solid and liquid substances aspirated into the container by the use of a sleeve (i.e. a conduit) in fluid connection to the same container are expelled from the same container through the same sleeve, during the succeeding step of pressurizing the container. Such industrial aspirators are provided with means of producing alternate steps of suction and pressurization according to various technical solutions.

[0003] For instance, in U54179768 the means of producing the suction and pressurizing the said container, and with it the liquid contents, includes a motorized ventilation unit and an associated duct whose position can be changed by an external rod. The latter, controlled by the operator, is raised or lowered in such a way as to modify the position of the duct relative to the ventilation unit, transforming it from an entry sleeve for the motorized fan in the case of suction of the liquid and solid substances into the container, into an exit sleeve for the same motorized fan in the case of expulsion by pumping of the aspirated liquid substances, and vice-versa. The other end of the duct is integrally fastened to the said container through an opening provided on the upper portion of the same and different from that of entry for the liquid and solid substances introduced into the container through the sleeve.

[0004] In US 4841595 an aspirator is described for liquid and solid substances that operates in a similar way to that described in a preceding document US4179768, differing from the latter in the means by which the suction or the pressurization of the inside of the container is produced. In practice, such means includes a motorized fan, a duct associated with the said fan, and a valve to divert

the flow of air in the duct to an opening provided on the container. In this way, using an external handle, the valve can easily be rotated by the operator in such a way as to direct the flow of the air through the said opening from the outside into the container, or vice-versa, according to the user applications.

[0005] Again, in US 6453507 an industrial aspirator is described for liquid and solid substances whose means of producing the suction or high pressure inside the container includes a motorized fan and two pairs of pneumatic valves that are opened alternatively to activate the suction or pressurization steps respectively of the aspirator.

[0006] Such industrial aspirators, although enabling alternate steps of suction and pressurization to be produced inside the container, are not lacking in drawbacks.

[0007] In fact, the means of producing and directing a flow of air in alternate ways from the outside into the container and vice versa, is structurally complex, since it is provided with valves actuated manually, or indirectly by a pneumatic/hydraulic/electric circuit, with the consequence that assembly of the aspirator, as well as its operation and maintenance, is more complicated.

[0008] Furthermore, such a means doesn't offer the chance of having very different heads in suction or in pumping, since a single ventilation unit produces both. In this way, in the case of suction or pumping of substances different from those treated usually, for instance, with different densities and/or viscosities, the aspirator could be subject to unpredictable drawbacks or malfunctions.

Object of the present invention

[0009] The purpose of the present invention is to produce an industrial aspirator for liquid/solid substances, that makes it possible to switch between the suction step and the compression step in a simple and automatic way, without employing valves operated manually or by pneumatic/hydraulic/electric circuits.

[0010] A further purpose of the present invention is to make the steps of suction and compression independent, in such a way as to be able to vary with extreme facility the workloads of the aspirator based on the type of liquid or solid aspirated into or pumped from the container.

Summary of the present invention

[0011] These and other purposes of the present invention are achieved by an industrial aspirator for the suction and discharging of liquid and solid substances, comprising a container to temporarily contain the said liquid and solid substances aspirated through a sleeve in fluid connection to the same, and a means of producing and directing a flow of air in alternate ways through one or more openings in said container from the outside into said container, and vice versa. Advantageously, the said means includes at least one first ventilation unit to produce said

flow of air from the inside to the outside of said container through said one or more openings, and at least one second ventilation unit to produce said flow of air from the outside into said container through said one or more openings, and at least one duct for each of said first and second ventilation units directing the said flow of air through said one or more openings of said container.

[0012] According to a further aspect of the invention, the first ventilation unit i.e. that unit which is able to produce the suction of the liquid and solid substances into the container, and the second ventilation unit i.e. that unit which is able to pump the liquid substances aspirated to the outside of the container, are fluidly connected. In this way, the two ventilation units can operate in parallel or in series. In the latter case, when the first unit is operating, the second unit is traversed by the flow of air produced by the first ventilation unit, and vice-versa in the case of pumping the liquid substances to the outside of the container.

[0013] Furthermore, according to a second embodiment, the ducts can be independent and meet at a single opening.

[0014] During use, when the level of the aspirated liquid exceeds a certain pre-arranged value, the first ventilation unit stops the aspiration, and the second ventilation unit, on the command of the operator, starts to produce a flow of air through the said opening from the outside into the container. Furthermore, a casing can be provided on the aspirator, in fluid connection to the external environment, and fastened to the container in such a way as to cover said means of producing and directing the flow of air to the inside or to the outside of the container.

[0015] Furthermore, according to the invention an air filter can be provided corresponding with each opening; a "basket" filter positioned to retain the solid substances aspirated into the container can also be provided.

[0016] Further characteristics and advantages of the present invention will become more evident from the detailed description of one or more preferred - but not exclusive - embodiments of the industrial aspirator for liquids and solid illustrated in the attached figures, in which:

Figure 1 is a side view of the industrial aspirator according to the invention;

Figure 2 is a cross-section view of the means of producing and directing a flow of air according to the invention;

Figure 3 is a second view in longitudinal section of the aspirator, during the pressurization step;

Figure 4 is a view in longitudinal section of the aspirator during the suction step;

Figure 5 is a cross-section view of the aspirator.

DETAILED DESCRIPTION

[0017] With particular reference to such figures, 1 indicates the generic industrial aspirator according to the

invention.

[0018] The aspirator 1, according to a preferred - but not by this limiting - embodiment of the invention, comprises a container 2 to temporarily contain the said aspirated liquid and solid substances 3 and means 4 of producing and directing a flow of air 5 in alternate ways through an opening 6 of said container 2, from the outside environment into said container 2, and vice-versa. The container 2, always according to the preferred embodiment, is provided in its upper portion 2a with a sleeve 7 that is employed both for the suction of the said liquid and solid substances 3 and for pumping to the outside the liquid substances previously aspirated. During the suction step, such liquid and solid substances enter the container 2 through the entry port 60.

[0019] According to the invention, means 4 of suction and pumping to the outside of the container 2 are provided and comprise a first ventilation unit 8, to produce a flow of air 5 from the inside to the outside of said container 2 through the opening 6, and a second ventilation unit 9 to produce a flow of air 5 from the outside into said container 2 through the same opening 6. Furthermore, such means 4 are provided with two ducts 11 and 12 in fluid connection to the two ventilation units 8 and 9 respectively for the purpose of directing the said flow of air 5 through the opening 6 of said container 2.

[0020] According to the preferred embodiment, the first ventilation unit 8 and the second ventilation unit 9 are in fluid connection with each other. In practice, as shown in figure 2, the two ventilation units 8 and 9 are arranged in series and the two ducts 11 and 12, which are connected to said ventilation units, form a single duct 13.

[0021] In a second embodiment (not shown here), the two ventilation units can be arranged in parallel, i.e. according to a Y-shaped duct layout, presenting a single opening 6, as in the preceding case, to which the two ducts converge, thus uniting into a single duct.

[0022] In a third embodiment (not shown here), the two ducts 11 and 12 can be fluidly independent one of the other, and be each connected to its respective unit 8 and 9 and to its respective opening of the container 2.

[0023] The embodiments here described can be provided with a casing 20, in fluid connection to the environment and fastened to the container 2, that serves to protect and to contain the means 4 of suction and pressurization of the container 2.

[0024] During the use, the operator activates the first ventilation unit 8 in such a way as to produce a flow of air 5 directed from the inside to the outside of the container 2, through said opening 6, such a way to exit from a hole 50 on the casing 20. In this way, suction pressure is created inside the container 2 with the consequent suction of liquid and solid substances through the sleeve 7. Such suction step can be stopped manually or, as shown by Figure 4, automatically, using a level-detector device 30 (for instance, of the float type, itself already known and therefore not described herein) for the aspirated liquid.

[0025] Thereafter, the operator can operate the second ventilation unit 9 which allows a flow of air to be produced directed from the outside 100 into the container 2, through the said opening 6. In this way, the pressure inside the container 2 is raised, and therefore also the pressure on the liquid contained in it, with the consequent pumping to the outside, through the sleeve 7, of the liquid substances previously aspirated.

[0026] According to the preferred form described here, during the operation of the first unit 8, the second unit 9 is stopped and is passively traversed by the flow of air 5 produced by the first unit 8. A similar situation is repeated in the opposite case, in which the first unit 8 is operating and the second unit 9 is stopped. The flow of air 5 in fact passively traversing the unit 9 only undergoes a slight reduction in force.

[0027] On the other hand, in the case of an aspirator produced in accordance with the second or the third embodiment described above, when the second ventilation unit 9 is operating to produce the pumping of the liquid content in the container 2, the first unit 8, temporarily stopped waiting to be operated, is not traversed by the flow of air 5 produced by the second unit 9. Obviously this is also repeated in the opposite case, i.e. when the first unit 8 is operating and the second unit 9 is stopped.

[0028] As is evident from the description above, the means 4 does not involve any interception valve to divert the air-flow depending on the operation step in which the aspirator 1 is involved, thus conferring notable advantages with respect to the operation and the maintenance of the aspirator 1.

[0029] The aspirator 1 can also include an air filter 31 located in correspondence of the opening 4 and a filter 32 to collect the solid substances aspirated. Such collection filter 32 is provided inside the container 2, is substantially in the form of a basket, and is removable when the aspirator 1 is opened to remove aspirated solid substances and/or to clean the inside parts of the aspirator 1.

[0030] The first and the second ventilation units 8 and 9 each comprise a fan 40 and an electric motor 41, in which the blades of the fan 40 of the ventilation unit 8 are oriented in the opposite direction to those of the fan in unit 9. Advantageously, according to the invention, the fan 40 and the electric motor 41 can have different technical characteristics according to requirements, for instance, in the case in which the suction step rather than the pumping step is required to be strengthened, and vice-versa.

[0031] It should be noted furthermore, that the number of the motors 41 or of the fans 40 of the first and of the second ventilation units 8 and 9 can also vary, without by this departing from the ambit of protection of the present invention. For instance, the first ventilation unit 8 could include two or more fans in series and a single motor, while the second unit 9 of ventilation could include only a single motor and a fan, thus biasing suction in preference to pumping. Vice-versa, the number of the fans of the ventilation unit 9 could be increased while

maintaining a single fan in the unit 8; in this way, the head that is developed in pumping compared to what is developed in suction is increased.

Claims

1. Industrial aspirator for the suction and discharging of liquid and solid substances, comprising a container to temporarily collect the said liquid and solid substances aspirated through at least one sleeve in fluid connection to that container, and means for producing and directing in alternate way a flow of air through one or more openings of said container from the outside into said container and vice-versa, **characterized by** said means comprising at least one first ventilation unit to produce said flow of air from the inside to the outside of said container through said one or more openings, at least one second ventilation unit to produce said flow of air from the outside into said container through said one or more openings, and at least one duct for each of said first and second ventilation units directing the said flow of air through said one or more openings of said container.
2. Aspirator according to Claim 1, **characterized by** said first and second ventilation units being in fluid connection with each other.
3. Aspirator according to Claim 2, **characterized by** said first and second ventilation units being arranged in series.
4. Aspirator according to Claims 2 and 3, **characterized by** said one or more openings being one in number.
5. Aspirator according to Claim 1, **characterized by** each duct of said first and second ventilation unit being independent of the other.
6. Aspirator according to any of the preceding Claims, **characterized by** comprising an external casing fluidly connected to the environment and fastened to the said container, said casing containing said means of producing and directing said flow of air.
7. Aspirator according to any of the preceding Claims, **characterized by** each of said one or more openings comprising at least one air filter.
8. Aspirator according to any of the preceding Claims, **characterized by** comprising at least one device for detecting the level of the aspirated liquid.
9. Aspirator according to any of the preceding Claims, **characterized by** said container comprising internally at least one filter to collect solid substances

aspirated.

- 10.** Aspirator according to Claim 10, **characterized by** said at least one filter for the solid substances being a "basket" filter.

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- 11.** Aspirator according to any of the preceding Claims, **characterized by** said first and second ventilation units including at least one fan and at least one electric motor.

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Fig.2

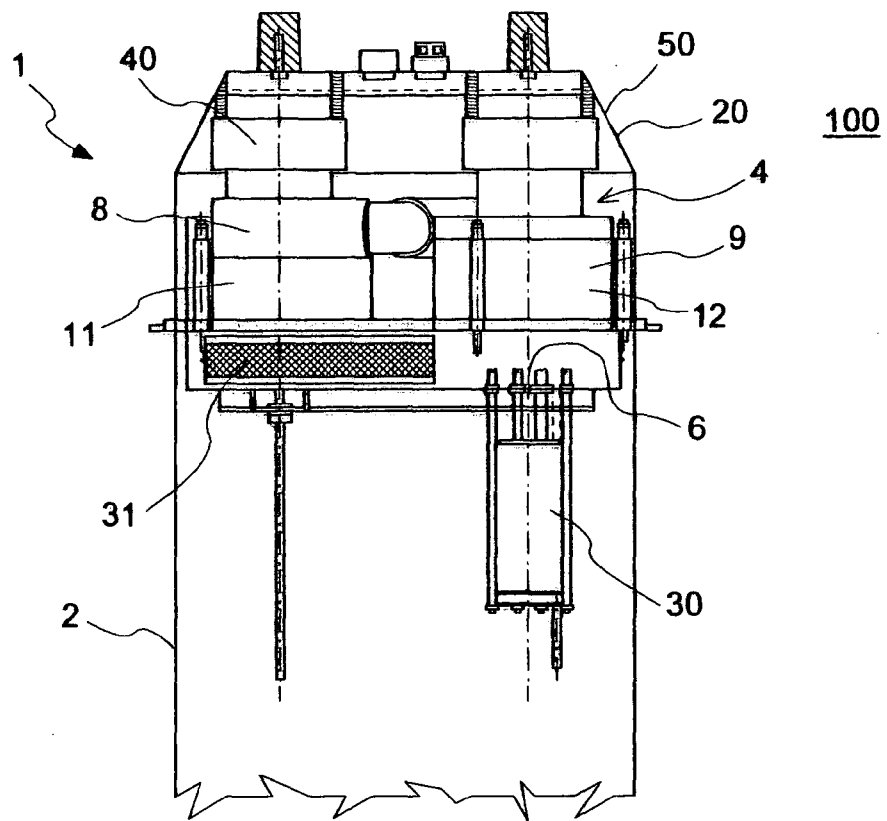
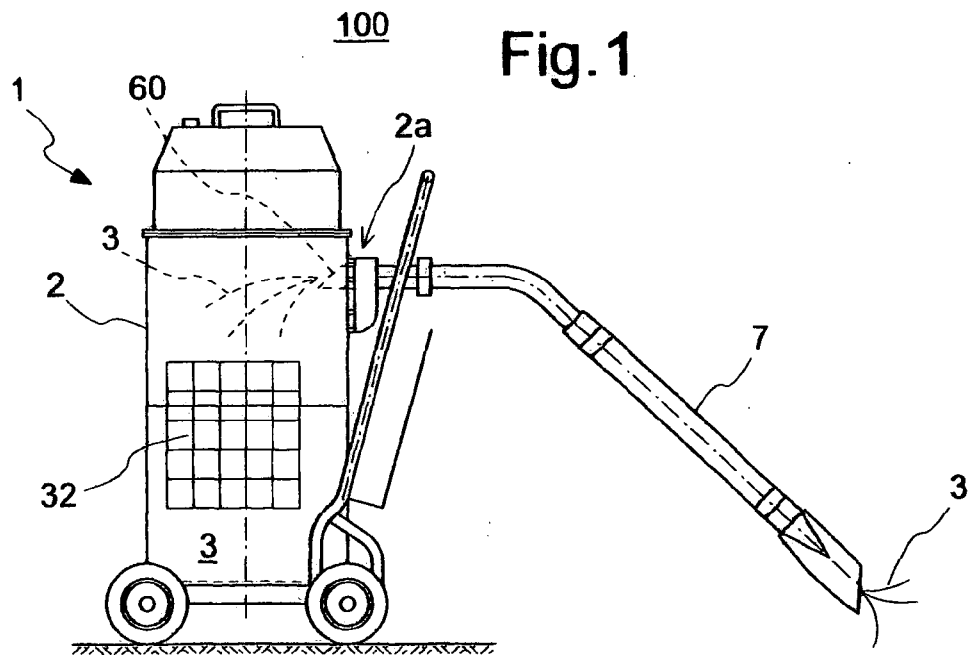


Fig.1



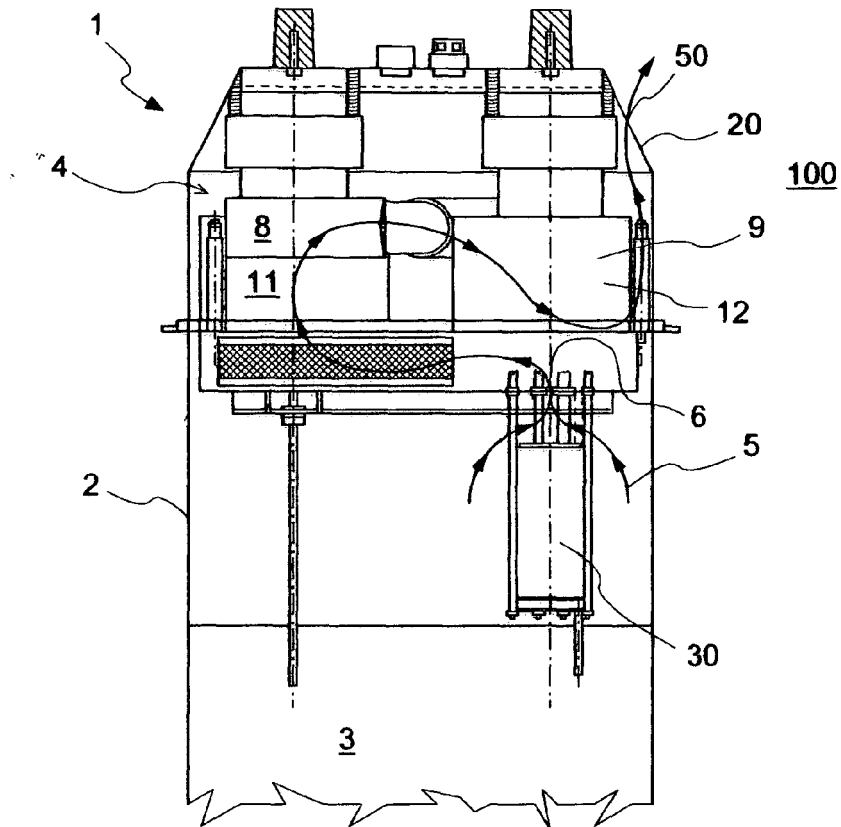


Fig.4

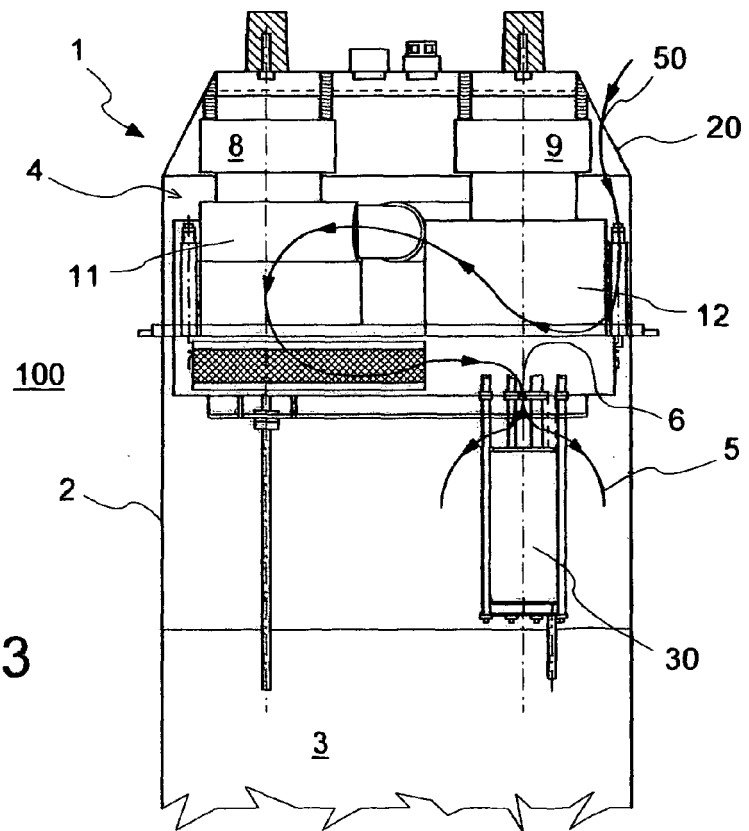
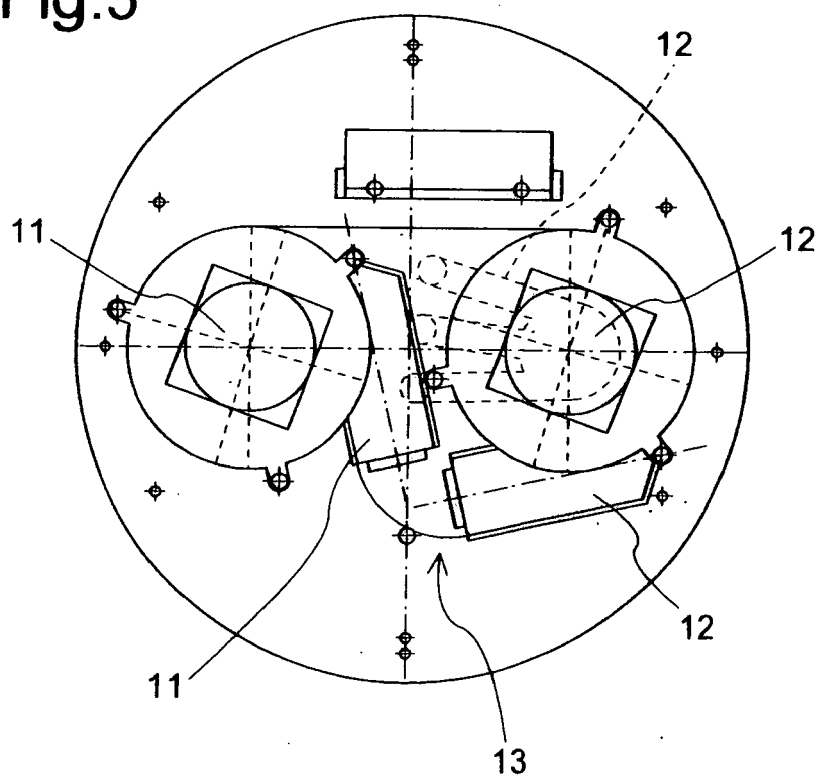


Fig.3

Fig.5





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 06 42 5770

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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			TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 11 April 2007	Examiner Lopez Vega, Javier
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.92 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 06 42 5770

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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11-04-2007

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US 4179768	A	25-12-1979	NONE	
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REFERENCES CITED IN THE DESCRIPTION

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